Appendix H
Equipment Description

Appendix H. Equipment Description

1. Process Description.

The MPF was manufactured and installed in 1980 to 1981. Midland Ross, the manufacturer, is no longer in existence. Therefore, the specifications, shop fabrication drawings, construction QA report, and operation and maintenance manuals are not available. Also, there is no model number for the MPF. CAMDS has PFDs for the MPF, and P&IDs and PFDs are included in Appendix Q.

a. The MPF System is composed of three major components:

(1) PCC.

(2) SCC.

(3) Pollution Abatement System (PAS) (for exhaust gases).

b. The PCC, SCC, and Feed Conveyor are located within a Ventilated Shroud. The Shroud and the remaining equipment, with the exception of the Prime Mover and Demister Vessel, are located within a prefabricated steel enclosure. The Prime Mover [Induced Draft (ID) Fan] and Demister Vessel are located on an exterior concrete pad adjacent to the MPF. The Prime Mover is a Robinson Industry model RB1806-5 SWSI described in Table H-1, and with a flow characteristic shown in Figure H-1.

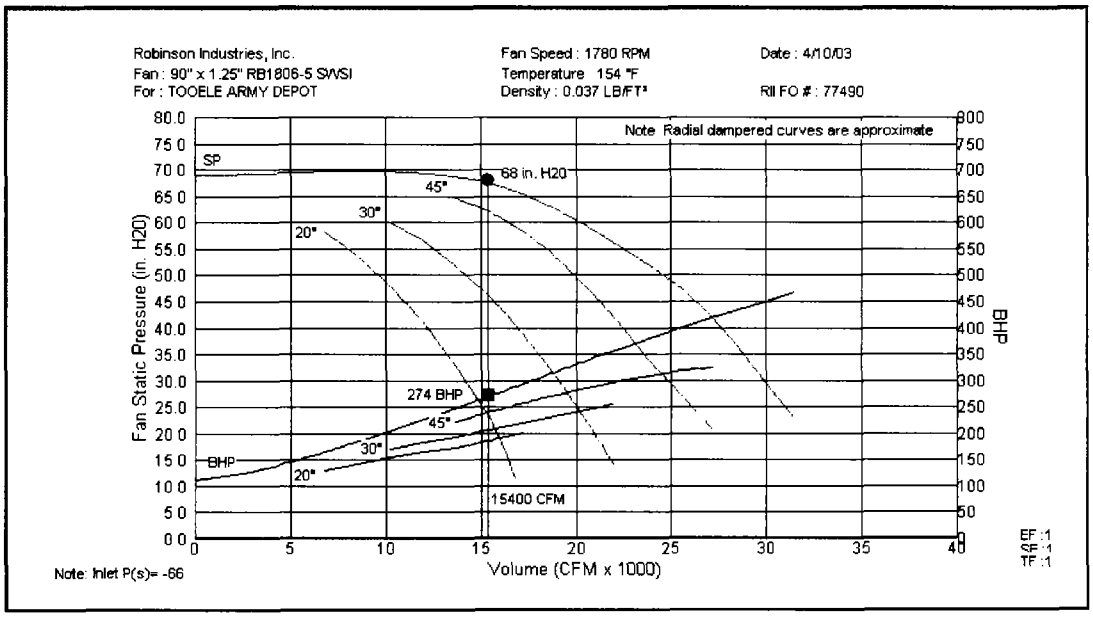

Figure H-1. Flow Characteristic for the Prime Mover.

c. Drawing SK05-072 (page Q-2, Appendix Q) shows a simplified process flow diagram of the MPF. The design description of the MPF and PAS is provided in Table H-1, page H-4.

d. The Ventilation System is needed for processing chemical agent in the MPF:

(1) The Ventilation System is a cascade-type system, which ventilates the air in the MPF Shroud, Charge Car, and MDF/BIF Area, and is designed to bring in outside air.

(2) The air is moved through Carbon filters before it is discharged to the atmosphere. The Ventilation System reduces, to the greatest practical extent, any fugitive emissions from the operations inside the MPF Shroud.

(3) The Ventilation System is designed and operated IAW Section 2, Ventilation, in US Army Corps of Engineers, Huntsville Division, *Chemical Stockpile Disposal Program, Safety Design Requirements Manual.*

2. Metal Parts Furnace.

a. PCC.

(1) The MPF PCC is a roller hearth furnace located inside a Ventilated Shroud.

(2) The MPF PCC is made up of three areas:

(a) An uninsulated Entry Airlock.

(b) A refractory-lined heating chamber for controlled volatilization and incineration of hazardous materials (PCC, Zone 1).

(c) A secondary refractory-lined heating chamber for final burnout of hazardous materials (PCC, Zone 2).

(3) The heating Chambers, Zone 1 and Zone 2, of the MPF are provided with natural gas burners arranged to give direct flame impingement of the side of the TCs. Auxiliary fuel controlled Burners are provided above and below the work level for heating the TCs.

(a) The gases from the PCC travel through a refractory-lined duct to the SCC, Zone 1.

(b) The PCC is maintained under negative pressure by an Induced Draft (ID) Fan (Prime Mover).

(c) Two identical combustion air blowers (North American Series 2331-21/2 T40D) supply air to PCC and SCC. Only one of the two blowers (351A and 351B) is used at a time while the other is a backup. For the local operating condition of 55.36 iwc, they are rated at 2400 scfm.

(4) The Engineering Description of the PCC is provided in Table H-1, page H-4.

b. SCC

(1) The SCC is a horizontal, refractory-lined cylinder with two heated zones containing four Burners, two in each zone.

(2) Fumes from the Entry Airlock and PCC pass through the SCC. The SCC operates with a flue gas temperature of 1,650° F and provides a minimum residence time of 1.0 seconds.

(a) The normal operating temperatures for these Zones are 1,600° F and 1,650° F, respectively.

(b) Gases exit the SCC to the PAS through a refractory-lined duct.

(3) There is no isolation damper between the MPF and LIC SCC exhaust, which share a common PAS and stack. There are valves on the discharge side of the LIC combustion air blowers that will be closed effectively providing the same effect of a duct isolation damper.

(4) The Engineering Description of the SCC is provided in Table H-1, page H-4.

c. PAS. The MPF and the Liquid Incinerator (LIC) both share the common PAS. During the Trial Burn, the LIC will be shut down. There is no isolation damper between the LIC and MPF SCC Exhaust duct. However there are valves on the discharge side of the LIC combustion air blowers that will be closed which will control air in-leakage from the LIC.

(1) The MPF PAS consists of a Quench Tower, Venturi Scrubber, Packed Bed Scrubber, Demister, ID Fan, Exhaust Gas Stack, Holding Tanks and associated pumps and piping. The MPF shares the PAS with the LIC. This configuration is shown on Drawing 05-187-02 (page F-7, Appendix F).

(2) The effluent gases from the MPF flow to the MPF/LIC Quench Tower where they are quenched by either air atomized water or quench brine. From the Quench Tower, the saturated gases flow into a high-energy Venturi Scrubber followed by a Packed Bed Scrubber and Demister Vessel. The ID Fan provides motive power for the gas flow circuit. Gases are vented through a Stack equipped with a Continuous Emissions Monitoring System (CEMS).

(3) The purpose of the PAS is to cool and scrub the acid exhaust gases and capture the fine particulate matter produced by the combustion process.

(4) The Engineering Description for each item in the PAS is provided in Table H-1, page H-5.

(a) Quench Tower

1 The Quench Tower is mounted on top of the Venturi Scrubber and concurrently operates with the Gas Flow/Spray System (Drawing Q-16, Appendix Q). The quench unit was installed in the late 1970's, no manufacturer or model name is available.

2 Gases entering the Quench Tower from the SCC are cooled to saturation with an air atomized water nozzle system or with recirculated brine from the Scrubber Tower Sump. This quench action assures maximum temperature reduction of the flue gases before they enter the Venturi Scrubber. Although not the primary purpose, some gas absorption and particulate removal also occurs in the quench tower.

3 Water flow to the spray nozzles is supplied from the Plant Water Supply and each water spray nozzle is controlled manually. A Flow Indicator is provided for each spray nozzle. There is no minimum pressure setting for these atomizing spray nozzles. The temperature of the plant water is ambient.

4 Quench brine flows to a set of spray nozzles located in the upper part of the Vessel. Flow of the quench brine is monitored remotely in the CAMDS Site Control Module. The brine originates from the bottom of the scrubber tower, and the temperature ranges from 150 to 175° F.

5 Effluent gas exit temperature is not controlled directly. The quench brine/spray water flow is adjusted manually to balance the temperature of the gas stream. Process specifications for the quench tower are provided in Table H-2.

Table H-1. Metal Parts Furnace Engineering Description

	PCC[1]	SCC[2]
NAME	Surface Combustion, Division of Midland Ross; no model number	Surface Combustion, Division of Midland Ross; no model number
TYPE	Roller Hearth, 2-Chamber	Horizontal Refractory Lined
DIMENSIONS	**Zone 1** Width: 4 ft[3] Height: 5 ft 9 inches Length: 12 ft **Zone 2** Width: 4 ft Height: 5 ft 9 inches Length: 12 ft **Total Volume:** 552 ft^3 [4]	**Zone 1** Outside Diameter: 6 ft 2 inches Length: 21 ft 6 inches Inside Diameter: 4 ft 6 inches * Zone 1 is made of 3 refractory lined bolted sections. (Sections 2, 3, and 4) **Zone 2** Outside Diameter: 6 ft 2 inches Length: 23 ft Inside Diameter: 4 ft 6 inches * Zone 2 is made of 3 refractory lined bolted sections. (Sections 6, 7, and 8) **Total Volume:** 683 ft^3
MATERIALS	Refractory Lined Carbon Steel	Shell Material: Carbon Steel **Zone 1** The Hot Face of each section is lined with 4½ inches of 2300 IFB[5], over 4½ inches 2300 IFB. The inlet end of Section 2 is lined with 3000 IFB, as well as each section connection joint. **Zone 2** The Hot Face of each section is lined with 4½ inches of 2300 IFB, over 4½ inches 2300 IFB. The inlet end of Section 2 is lined with 3000 IFB, as well as each section connection joint.
BURNERS	10 North American Burners Model 4422-4 5800 scfh[6] (Burner runs 20% above stochiometric) 16 osi[7] 580,00 Btu/hr[8]	4 North American Burners, Model 4441-6 15,700 scfh (Historically, the burner runs 20% above stochiometric) 16 osi 1,570,000 Btu/hr
DUCT DIMENSIONS	NA[9]	**Inlet Duct** Outside Diameter: 21 inches Inside diameter: 14 inches Lining: 3¼ inches thick Elbows Radial length with flanges: 4 ft 1½ inches 1st pipe with flanges: 2 ft 5 inches 2nd Pipe with flanges: 3 ft 8¾ inches 3rd pipe with flanges: 6 inches Total length: 14 ft 10¾ inches **Outlet Duct** Outside Diameter: 3 ft 4 inches Inside diameter: 2 ft 6 inches Lining: 4¾ inches thick Elbows Radial length with flanges: 6 ft 3⅜ inches 1st Pipe with flanges: 7 ft 5½ inches 2nd Pipe with flanges: 7 ft 5½ inches

(1) Primary Combustion Chamber (2) Secondary Combustion Chamber (3) feet (4) cubic feet (5) Insulated Firebrick
(6) standard cubic feet per hour (7) ounces per square inch (8) British Thermal Unit per pound (9) Not Applicable

Table H-1. Metal Parts Furnace Engineering Description (Continued)

MATERIALS	NA	**Inlet Duct** Pipe: Carbon Steel Elbow: Carbon Steel Lining: Castable refractory 2200° F[10] (B&W 2000-L1) **Outlet Duct** Pipe: Carbon Steel Elbow: Carbon Steel Lining: Castable refractory 2200°F (B&W 2000-L1)
TRAY	Material: HT SS Alloy 1,130 pounds	
AUXILIARY FUEL	Natural Gas	
PRIME MOVER	ID Fan, Robinson Industries RB1806-5 15,400 acfm[11] at 154° F 68 iwc[12] 274 -horsepower	
GAS MONITORING	Incinerator Exhaust: Continuous Emissions Monitoring System for Carbon Monoxide and Oxygen Hydrocarbon Analyzer [data collection for MACT[13] compliance only]	
AUTOMATIC WASTE FEED CUTOFF (AWFCO)	**Primary Operating Parameters and Conditions Causing an AWFCO** • Loss of flame in either the PCC or SCC. • An AWFCO activated. • Loss of draft in PCC (operational parameter).	
QUENCH TOWER	Cylindrical Vessel (3 ft 6 inches diameter) with spray nozzles Quench Media: Brine and air atomized process water Material: Inconel 625	
VENTURI SCRUBBER	Variable Throat Range: 15-45 iwc Scrubbing Media: Caustic Brine maintained at pH 9.5 ± 0.5 Materials: Hastelloy G Anderson 2000, Model WAV-110	
CAUSTIC TANK	Dimensions: 6 ft diameter by 12 ft high Materials: Stainless steel	
PACKED BED SCRUBBER	Dimensions: 6 ft diameter by 10 ft high Scrubbing Media: Caustic Brine maintained at pH 9.5 ± 0.5 Materials: Polypropylene packing saddles	
ELIMINATOR PAD	Dimensions: 6 ft diameter by 10 inches thick Materials: Stainless steel	
DEMISTER VESSEL	Dimensions: 2 ft diameter by 12 ft long Quantity: 12 Fiber bed mist eliminators Materials: polyester fiber 50/50 layer blend (CECO Mfg.) with pre-filters made of the same material, and stainless steel wire cages for polyester filters	
EXHAUST STACK	Dimension: 2 ft diameter by 62 ft 6 inches high (cross sectional area: 3.1416 sq.ft.) Materials: Mild Steel	

(10) degrees Fahrenheit (11) actual cubic feet per minute (12) inches water column (13) Maximum Achievable Control Technology

Table H-2. Mpf Quench Tower Specifications

Item	MPF/LIC
Spray Nozzles Number Size Make Model	 4 ¼ inch Spraying Systems Inc. ¼ AE-5-120-SS
Nozzles Locations	8-1/2 inches below inlet
Atomizing Media Pressure	0-80 psig
Expected Droplet Size Range	50-100 microns
Turndown Ratio	18:1
Nozzle Design Pressure	40 psig
Water flow rate	0.4 to 7.3 gpm
Quench tower dimensions	3 ft diameter, 6 ft 3 inches height
Materials of construction in Quench Tower Extension sprays	Inconel with refractory (first 2 ft) 303SS
Ancillary Monitoring Equipment Control Equipment	Thermocouple

6 Latent heat removal efficiency data is not available, an estimate based on the maximum water flow rate is provided:

a Assumptions:

5% excess water flow, over saturation
2. water temperature 60° F.

water evaporated = 0.95 × 7.3 = 6.94 gpm.
latent heat for water at 60° F is from Perry's Chemical Engineering Handbook, 5th ed. pg. 3.206, Properties of Saturated Steam.

b max. latent heat removed

= (1087.7 - 28.06) BTU/lb x 6.94 gal/min x 8.345 lb/gal x 60 min/hr

= 3.68 x10^6 BTU/hr.

c No design or nominal combustion gas flow velocity is available.

(b) Venturi Scrubber. The venturi scrubber was manufactured by Ducon, and installed in 1977. Modifications were made to the automatic control adjustment capability to the variable throat. No model number is available for the venturi scrubber. Specifications are provided in Table H-3, page H-8. See Drawing Q-16, Appendix Q.

1 The Venturi Scrubber is provided to remove particulate from the quenched exhaust gas stream.

2 Cooled, saturated flue gases from the Quench Tower flow into the top of the Venturi Scrubber and come in contact with brine recirculated from the Scrubber Tower Sump.

3 The brine is filtered through a duplex strainer at the Sump to remove solids that could plug the Venturi nozzles. The nozzles are designed to be removed and cleaned individually when they become clogged.

4 The Venturi Scrubber contains a variable area throat that is adjusted to maintain the specified pressure drop across the unit in order to maximize the removal of particulates from the gas stream.

5 The Quench/Venturi Brine pH is monitored as an AWFCO. The MPF Operator adjusts the pH manually. A pH sensor and transmitter monitors the pH of the liquid and provides the appropriate reading to the Operator. The MPF Operator then adjusts the pH level by adding caustic or water to the System.

6 The specific gravity of the Quench/Venturi Scrubber liquid is monitored manually by the MPF Operator. When the specific gravity approaches the set limit, a portion of the liquid is pumped to the Brine Retention Tanks. Fresh caustic and/or water is then added to the System.

7 Manufacturer's performance data for the Venturi Scrubber are not available. A general performance curve for Venturi scrubbers operated at 40 to 50 iwc pressure drop indicates the collection efficiency ranges from 45 percent for 0.1 µm diameter to 99.9 percent for particles greater than 0.9 µm diameter (Corbitt, page 4.34, References, Appendix V).

(c) PAS Brine Retention Tanks

1 Brine Tanks are provided to permit isolation of the brine solutions.

2 The brine from either the Clear Liquor or the Scrubber System is sent to the Retention Tanks.

3 When the pH requires adjustment or the specific gravity is too high, the MPF Operator will move a portion of the brine to the Retention Tanks. The solutions are held in the Tanks until the Operator is ready to send them to the Brine Reduction Area.

4 During shutdown operations, the MPF Operator may return the brine to the Scrubber System to reduce the volume of the liquid sent to the Brine Drying Area. The spent brine is added back to the Scrubber System instead of makeup water.

Table H-3. Venturi Specifications

Item	MPF
Spray Nozzles Number Size Make Model	 6 1-¼ inches Bete MP531N
Nozzle Location	3 @ 21 inches below inlet 3 @ 27 inches below inlet
Atomizing Media Pressure	30 psig
Expected Droplet Size	100 microns
Design/Maximum Pressure Drop	38.8/45 inches water column
Design Inlet Gas Flow	6917 acfm
L/G Ratio	17.3 gpm/1000 acfm
Minimum Brine pH	7
Maximum Design Total Dissolved Solids in Scrubber Liquid	15%
Throat Control	Manual or Automatic
Construction Materials	Hastelloy G
Ancillary Monitoring Indicators	Liquid Flow Temp
Control Devices	Manual or Automatic Flow Control of Liquid
Pumps No. Type Capacity Horsepower Mfg. Spec.	 1 Centrifugal 320 gpm 15 Goulds 3196MT 3x4-10 or other ANSI standard process

(d) Caustic Tank

1 The Caustic Tank provides an interface supply between the main Site Caustic Supply and the Scrubber System. It is equipped with a level control and an automatic blocking valve on the inlet.

2 The Tank is 2,000 gallons and is sized for approximately 8 hours of operation of 18% Sodium Hydroxide, by weight, at 125% of the normal flue gas flow rate.

(e) Packed Bed Scrubber Tower

1 The Packed Bed Scrubber Tower is designed to neutralize the acidic gases with a countercurrent liquid and gas flow as they pass through the System.

2 The gases from the Venturi flow upward through the Scrubber packing, and the liquid flows downward. Polyethylene plastic saddles provide contact for the liquid with the gases to facilitate the removal of the acidic products of combustion.

3 The liquid rundown is collected in a separate vessel for recirculation back to a distributor at the top of the Scrubber packing.

4 Gases exiting the Packed Bed Scrubber Tower are conveyed to the Demister Vessel through an unlined duct. Specifications of the packet tower scrubber are provided in Table H-4, page H-10.

(f) Mist Eliminator Pad. A York® Mist Eliminator Pad is located directly above the Packed Bed Scrubber and is designed to remove large droplets of liquid carryover.

Table H-4. Packed Bed Scrubber Specifications

Item	MPF/LIC
Packing Media	2 inch polypropylene Intalox Saddles
Packing depth	7 feet
Design pressure inlet gas flow	16100 (acfm)
L/G ratio	19:1 gpm/1000 acfm
Maximum design total dissolved solids in liquid	15 %
Minimum pH of liquid	7.0
Maximum expected HCL loading	156 lb/hr
Construction of Scrubber Materials	Carbon steel with monel or Stellite Lining
Ancillary Equipment Location and Description Monitoring Control	None. Manual or Automatic liquid flow control
Pumps Type Number Horsepower Capacity Mfg. Specs.	 Centrifugal 1 15 300 Goulds 3196MT or other ANSI Standard Pump

(g) Demister Vessel

1 The Demister Vessel is downstream from the Packed Bed Scrubber Tower and located outside the MPF. The Vessel is connected to the Scrubber Tower with a steel duct and contains 12 Fiber Bed Mist Eliminators.

2 The Fiber Bed Mist Eliminators contain polyester filters in stainless steel cages.

3 Pressure drop across the Demister Vessel ranges between 1 to 30 iwc.

4 The filters are rated at 99% removal efficiency for mist particles 3 microns or smaller and are not affected by an increase in pressure drop.

5 The pre-filters and filters in the Demister Vessel will be changed if the pressure drops start becoming excessive (with the option of changing out the main filters upon inspection).

6 Gases from the Packed Bed Scrubber flow through the unit from the inside to outside.

(h) ID Fan

1 The ID Fan is considered to be the Primer Mover and is located outside the MPF and downstream of the Demister Vessel.

2 The Fan pulls the combustion gases through the PCC, SCC, and the PAS and exhausts them to the atmosphere.

3 An automated damper controls the draft in the PCC to a setpoint of -2 iwc.

4 The Fan motor speed is controlled by a variable speed drive system that maintains a negative pressure in the MPF combustion zones.

(i) Exhaust Stack

1 Stack sampling ports are located at different levels. Also located in the stack is a sampling port for the CEMS.

2 A Gas Flow Sensor is located at mid-point and measures the stack gas flows.

d. Scrap Handling and Cooling Equipment.

(1) A ventilated hooded station is provided at the MPF Discharge End.

(2) Monitoring is performed at the Discharge End. Testing has established acceptable operating parameters to ensure that material exiting the MPF is decontaminated. Since agent has been processed in the MPF and adjacent MDF areas in the past, CAMDS will monitor with ACAMS at the charge car and discharge canopy with ACAMS (at the TWA level). Monitoring will be performed for HD.

e. MPF Cooling Bays

(1) Two air-cooling Chambers are located within the enclosure and adjacent to the MPF Discharge Car Traverse Track, for cooling the processed TCs.

(2) The processed TCs are removed from the hooded station and transferred to one of the Cooling Chambers by a Transfer Car.

(3) The Transfer Car is remotely controlled for maximum operator safety.

(4) The Cooling Chambers are completely enclosed with a steel Shroud to direct the cooling airflow. Each Chamber has a remotely operated, vertical-rising door to minimize air entrainment.

f. Discharge Area

(1) Processed TCs are conveyed on Trays using the Discharge Car to shuttle the Trays to an off loading roller conveyor located in the receiving and unloading area.

(2) This area is serviced by a rail crane and hoist.

3. Manufacturer's Name, Model Number and Capacity.

a. The MPF is a custom design manufactured by Surface Combustion, a Division of Midland Ross. It has been modified from the original design. Both Combustion Chambers have been modified.

b. The total thermal rating of the PCC and the SCC are provided in Table H-1, page H-4.

4. Type of Incinerator.

a. The MPF is a direct-fired, two-chamber roller hearth furnace.

b. Exhaust gases from the PCC pass through to the SCC and then from the SCC to the PAS.

c. Temperatures between 1,100° F to 1,300° F (depending upon the waste being processed) are maintained in the PCC. The SCC is maintained between 1,600° F and 1,650° F.

5. Description of the Supplemental Fuel Systems.

a. Natural gas is pumped directly to the ten burners located in the PCC of the MPF.

b. Fuel consumption in the PCC during normal operation is 717 to 5,800 scfh natural gas.

c. The SCC consumes 14,350 to 44,800 scfh natural gas during normal operation.

6. DESCRIPTION OF AUTOMATIC WASTE FEED CUTOFF SYSTEMS.

a. The AWFCO System prevents the TCs from moving into the PCC from the Entry Airlock if one or more of the following occur:

(1) Monitors for Combustion Chamber temperature, gas flow or CEMS do not operate properly or data are not being recorded.

(2) Loss of flame for either the PCC or the SCC Burners.

(3) Waste feed cut-off set points are exceeded.

b. The process parameters required by the RCRA Part B Permit, the MACT Ruling, and the CAMDS Site to activate the AWFCO System are provided in Table C-2 (page C-4, Appendix C).

c. Process instrumentation for AWFCO is monitored on a graphic display in the Control Module so that individual operations can be checked at any time for correct function without disturbing the System.

(1) The EPA Computer monitors each AWFCO and records the events that may occur.

(2) A MPF Logbook is maintained at this location where a record is kept of each AWFCO occurrence, the reasons for the occurrence, and what actions were taken to rectify the situation.

d. System checkout for proper operation of AWFCO is performed each time the MPF is started or at the minimum of every 7 days. Each device is maintained and calibrated according to Test Plan 05-76, *Metal Parts Furnace CMS Performance Evaluation Plan* (References, Appendix V).

e. Feed to the MPF System is controlled by several AWFCO parameters which are provided in Table C-2 (page C-4, Appendix C). Each cutoff parameter is discussed below.

(1) PCC, Zone 1 (Tag No. TI-205AL) and Zone 2 (Tag No. TI-207AL), and SCC, Zone 1 (Tag No. TI-202AL) and Zone 2 (Tag No. TI-201AL), Temperatures, "High" and "Low" waste feed cutoff.

(a) The temperatures are monitored by Type K Thermocouples with a range of 0 to 3,300° F

(b) The Thermocouples extends into the Chambers and are connected to the PLC input card.

(c) Thermocouple data are recorded and monitored.

(d) The PLC is programmed with an interlock that is set at the high PCC and SCC limits (1,750° F and 2,175° F, respectively) and the low PCC and SCC limits (950° F and 1,450° F, respectively) of the MPF.

(2) PCC Draft Pressure (Tag No. PT-504) "Low" waste feed cutoff.

(a) A Pressure Transmitter (Rosemount, Model 3051) controls draft pressure at or lower than 0 iwc in the PCC. This ensures that no fugitive emission can escape from either of the Combustion Chambers.

(b) Pressure measured by this Transmitter is relative to the atmosphere.

(c) The Transmitter sends the pressure reading to the PLC where an interlock is set at 0 iwc.

(3) Venturi Scrubber Pressure Drop "Low" (Tag No. PDT-001) waste feed cutoff.

(a) A Pressure Transmitter (Rosemount Model 1151) measures the Venturi Scrubber pressure differential above and below the throat opening of the Venturi Scrubber.

(b) The PLC is programmed with a setpoint at which the pressure differential is maintained during operations. The throat opening is varied automatically by the PLC to control the pressure differential.

(c) The current RCRA Permit limit states that the pressure differential must be greater than (>) 20 iwc. The CAMDS Title V air permit has a more restrictive requirement of a pressure differential of at least 36 iwc. The more restrictive limit will be in force during the Trial Burn.

(4) Venturi Scrubber Brine Flow "Low" (Tag No. FE-001) waste feed cutoff.

(a) Venturi Scrubber Brine is pumped to the Scrubber where it is injected through several nozzles. When the liquid passes through the Venturi, it is collected in the Scrubber Tower Sump where it is recirculated back to the Venturi.

(b) An orifice plate type Flow Meter measures the Venturi Brine flow. Differential Pressure Meter measures the pressure differential across the orifice plate when Brine is flowing. The pressure reading is converted into a flow measurement by the PLC.

(c) The current RCRA Permit states that the flow must be > 30 gpm.

(5) Venturi Scrubber Brine pH (Tag No. AI-4A and AI-4B) waste feed cutoff.

(a) As the Venturi Brine is circulated through the System, caustic is added to adjust the pH of the liquid. This ensures that sufficient caustic is present to aid in the removal of HCl.

(b) A set of two pH Sensors are installed in the liquid loop to ensure the pH of the solution remains at the desired value and that the System remains on line when one is removed for cleaning. The Sensors are connected to the AWFCO and shut down when the waste feed value is < 7.

(6) Clear Liquor Brine Flow "Low" (Tag No. FE-002) waste feed cutoff.

(a) A Wier Distribution Trough pumps Clear Liquor Brine to the Packed Bed Scrubber where it is distributed across the Bed. When the liquid passes through the Packed Bed Scrubber, it is collected in the Clear Liquor Stand Pipe to be recirculated back to the Packed Bed.

(b) An orifice plate type Flow Meter measures the Clear Liquor Brine flow. A Differential Pressure Meter measures the pressure differential across the orifice plate when Brine is flowing. The pressure reading is converted into a flow measurement by the PLC.

(c) The current RCRA Permit limit states that the flow must be >150 gpm.

(7) Clear Liquor Brine pH (Tag No. AI-3A and AI-3B) waste feed cutoff.

(a) As the Clear Liquor Brine is circulated through the System, caustic is added to adjust the pH of the liquid. This ensures that sufficient caustic is present to aid in the removal of acid in the exhaust gases.

(b) A set of two pH Sensors are installed, function, and have the same interlock system as those described above in 6.e(5)(b) of Appendix H (this page).

(8) Venturi Temperature "High" (Tag No. TI-21) waste feed cutoff.

(a) Gases and liquid from the Venturi pass through a common duct connected to the bottom section of the Scrubber Tower and to the PLC. The gases turn upward and pass through the Packed Bed Scrubber. The liquid flows to the bottom of the Scrubber Tower where the Sump is located.

(b) The Thermocouple, Type J, measures the Venturi outlet gas temperature and is connected to the AWFCO System to shut down the waste feed if the temperature exceeds 190° F.

(9) Stack O_2 concentration (Tag No. AI-19A) waste feed cutoff.

(a) A sampling port is located in the duct connecting the Demister Vessel with the Exhaust Stack where scrubbed gases pass from the Scrubber System to the atmosphere. An Analytical Indicator monitors the O_2 levels being emitted.

(b) The current RCRA Permit levels for O_2 in the Stack is 18%. If the level of O_2 reaches a level > 18% or less than (<) 3%, the PLC will automatically shut down the waste feed to the MPF.

(10) Stack CO concentration (Tag No. AI-19B) waste feed cutoff.

(a) CO levels are monitored as the O_2 levels discussed in 6.e(9)(a) above.

(b) If the CO level reaches > 100 ppm corrected to 7% O_2 on a dry volume basis for a 60 minute rolling average, the PLC will automatically shut down the waste feed to the MPF.

(11) Stack Gas Velocity (Tag No. FI-005) waste feed cutoff.

(a) A Kurz Air Velocity Transducer Flow Meter measures the Exhaust Stack gas flow rate and is connected to the PLC for data collection as well as an AWFCO.

(b) If during operation the flow is > 13,600 actual cubic feet per minute (acfm) or < 6,500 acfm, the PLC will automatically shut down waste feed to the MPF.

7. Stack Gas Monitoring and Pollution Control Equipment.

a. A CEMS monitors the Exhaust Stack emissions from the MPF. The System is comprised of a set of analyzers that measure the O_2, Carbon Dioxide (CO_2), CO, Sulfur Dioxide (SO_2), and Nitrogen Oxide (NO_x) content of the exhaust gases. Two analyzers are provided for each compound: one is in standby mode and the other is online. Only the O_2 and CO levels are connected to the AWFCO System. The others are monitored for data collection only. The CEMS are manufactured by Rosemount, model 2000 series.

b. A sample probe with an external ceramic filter, located in the duct connecting the Demister Vessel to the Exhaust Stack, is used to draw a sample from the Stack. The sample is transported to the analyzers through a temperature controlled sample transport line by a constant volume gas sample pump. Prior to entering the analyzers, the sample passes through a gas conditioning system.

c. The raw data from the analyzers are sent to the PLC and transferred to the AWFCO Computer where data are collected, calculated, and stored. Data are compared to pre-set limits resulting in "no action", "alarm", or "shutdown of the HW Feed System".

d. The specific EPA Method procedures which follow the required measurement parameters and test methods are Title 49 CFR, Part 266, Appendix IX, Section 2.0, *Performance Specifications for Continuous Emission Monitoring Systems* and Title 40 CFR, Part 60, Appendix A, *Test Methods, Method 3A for O_2 and CO_2 and Method 10 for CO.*

e. Certification of the analyzers is performed on a quarterly basis as required by 40 CFR Part 266, Appendix IX, and 40 CFR Part 60, Appendix B. Details of this certification and performance specification are contained in the *Final Report for the Relative Accuracy Test on the CAMDS Site MPF CEMS* (References, Appendix V).

f. During MPF operation, the CEMS is calibrated every morning prior to commencing waste incineration. Calibration data will be provided in the Miscellaneous Waste Trial Burn Report.

g. A detailed description of the process instrumentation, including the CEMS is given in Appendix M, the CMS Performance Evaluation Test Plan.

8. Nozzles and Burner Design.

a. Each Burner in the PCC is a North American Burner Model 4422-4. The Burner model is rated for 5800 scfh.

b. In the SCC, each Burner is a North American Burner, Model 4441-6 and rated for 15,700 scfh.

c. All Burners operate with natural gas and are equipped with their own Flame Safety System.

d. The Burner Ignition and Flame Management System for the PCC consists of a Honeywell Microcomputer Burner Control System (Model RM 7890B) and a Dynamic Self-Check Flame Detector (Model C7061A). The SCC uses a Flame Rod (North American Model 4-25432-4).

(1) The Honeywell Microcomputer Burner Control System Unit monitors various voltages of the Burner controls. When the proper voltages are not present, the Burner is automatically shut down.

(a) The Unit includes automatic burner sequencing, flame supervision, status indication, and self-diagnostics.

(b) Safety features of the Unit include dynamic self-check logic, safe start check, dynamic input check, closed loop output check, and tamper resistant timing and logic.

(2) The Burner lighting sequence is as follows:

(a) The MPF Operator sends a signal to purge the Furnace. When all the control limits, and interlocks are met, the purge time relay performs a 15-minute purge of the Combustion Chamber using combustion air. At the completion of the purge, the CMO initiates a "call for flame." If the MPF is above 1,400° F, the purge is skipped.

(b) The Flame Pack progresses through the following lighting sequence:

1 Start up Safe Check. The Burner Control System verifies that a flame or flame simulating condition does not already exist and then proceeds into the Ignition Trial. If a flame or flame simulating condition is present, the Burner Control System remains in the "standby" period.

2 Ignition Trials. Ignition Trials are used to start the Flame. The Valves and Ignition Terminals are energized and the flame must be proven at the end of a 10-second Pilot Flame establishing period or a safety shutdown will occur. Once the flame is proven, the Pilot Valves and Ignition are de-energized and the Main Valve is energized.

3 The Flame Pack will then remain on until controller input is de-energized or if flame-failure occurs.

(c) When the main flame is established and proven, the control valve is released to the PLC and flame modulation can be performed.

(d) Normal shutdown of the Burner occurs when the MPF Operator sends a signal to the PLC to turn off the Burner. The main fuel valve is then de-energized.

(e) If the Flame Detector or Flame Rod does not detect a flame during normal operation of the Burner, the cycle will be interrupted and the sequence stopped. The Flame Management System will close the natural gas valves automatically to shut down the Burner. This ensures that fuel will not enter the Combustion Chamber when an ignition source is not present.

(f) The Burner controls and piping trains for the natural gas and combustion air, are located inside the Shroud containing the PCC and SCC. These controls are located in a walkway that can be readily accessed for adjustment and maintenance.

9. Location and Description of Temperature, Pressure and Flow-Indicating and Control Devices.

a. The locations of the indicating and control devices are shown on piping and instrument diagrams (P&IDs) included in Appendix Q.

b. The Control System has a centralized control console, closed-circuit television monitors for observing operations at various locations, and locally mounted PLCs. Most processing and sequencing operations are controlled automatically through the PLCs.

c. Interlocks are monitored and continuous checking is undertaken to determine any failure to complete a programmed step.

d. Abnormal conditions, Operator entries into the System, and starting and stopping of equipment are logged in the MPF CMO Logbook.

e. The Control System provides continuous automatic control of the incineration process.

f. In monitoring critical functions, the Control System gives advanced warnings of alarms where possible, indicating that an alarm condition is developing so Operators can be warned in time to take corrective action.

g. The instruments that monitor the MPF performance are provided in Table H-1 (pages H-5, H-6).